

REMARKS

Claims 16-30 are pending in the present application. Applicants have amended claims 16, 23 and 27 to recite limitations contained in claims 17, 24 and 28, respectively, and to recite a limitation depicted in Figures 5-8. Applicants have cancelled claims 17, 24 and 28, as the limitations of these claims have been incorporated in the respective claims from which they depend. No new matter has been added to the amended claim. Reconsideration of the claims is respectfully requested.

CLAIM REJECTIONS

35 U.S.C. 103(a) rejection over Richaud

The Examiner has rejected claims 16-30 under 35 U.S.C. 103(a) as being obvious in view of PCT Patent Publication No. WO 02/081123 A2 to Richaud (“the ‘123 publication”). The Examiner characterizes the ‘123 publication as teaching that the placement of perturbations on the surface of a stopper rod and/or nozzle at locations where clogging would occur reduces clogging at these locations. The Examiner also characterizes the present invention as an obvious modification of the teachings of the ‘123 publication with respect to ripple placement or configuration.

In response, Applicants have amended the current claims to recite elements not found in, or suggested by, the prior art. The ‘123 publication teaches a refractory piece having a perturbation. The perturbation is taught as being located at or near an outlet or inlet to or outlet of a bore of a refractory article (p. 4, lines 22-23). Other description of the perturbation is directed to its configuration (p. 5, lines 4-12), its effect (p. 5, lines 13-17), its combination with another feature (p. 5, lines 18-21) and its method of operation (p. 5, line 22 – p. 6, line 2). A perturbation at the point of contact would not be “at or near an outlet or inlet to or outlet of a bore of a refractory article.” If the perturbation were, or were at, the point of contact, the ‘123 publication would be anticipated by the prior art. The addition of a perturbation not at the point of contact produces two or more constrictions in the flow channel, as is seen in Figures 1, 2, 3b and 4 of the ‘123 publication. The configuration of the present invention, as is recited in the amended claims, relies on a single constriction in the flow channel.

The device of the ‘123 publication differs from that of the present invention in function as well as in form. The two or more constrictions in the flow path of the device of the ‘123

publication produce effects that are absent from the device of the present invention. These effects are exemplified by the situation in which a step is cut into the nozzle seat, as p. 5, lines 7 of the '123 publication. The step deflects the streamlines upstream of the step. The step forces the streamlines to deviate towards the nozzle seat where the step is located. The step creates a recirculation zone with velocity vectors turning in the same direction as the streamlines causing the streamlined deviation towards the nozzle seat.

In the present invention, there is a single constriction in the flow channel. Streamlines are not altered by a flow obstruction, but rather by detachment from a surface as a result of flow channel widening. The configuration of the present invention urges streamlines away from, rather than towards, a surface. The recirculation regions thus formed are more controllable, in terms of size and location, than the turbulent eddies formed by a constriction, and are thus more suitable for situations in which a controlled eddy is needed to sweep unwanted particles away from a given location.

In addition, the absence of consecutive constrictions in the present invention eliminates volumes in which unwanted particles are likely to accumulate. The embodiments taught in the '123 publication contain such a volume. For example, the step depicted in figures 1 and 3b interrupts streamlines and draws flow into a volume above the step. In the present invention, circulatory flow is found downstream of the ripples in a region where the flow channel only widens. Unwanted particles are thus unlikely to accumulate in the ripples.

The device of the present invention differs from the cited prior art in having a distinguishable configuration performing a distinguishable function. The single-constriction configuration of the present invention eliminates the particle-trapping volumes that are inherent in the designs of the '123 publication. For these reasons, the rejection of claims 16-30 under 35 U.S.C. 103(a) is believed to have been overcome.

Applicant respectfully submits that claims 16, 18-23, 25-27 and 29-30 are patentable over the prior art. Early and favorable action is earnestly solicited.

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Respectfully submitted,

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